RESEARCH STATEMENT

My research interests lie in the intersection of production, trade, and the environment. I study the connections of agriculture production, markets, policies, and the environment through two complementary lenses: (i) global-to-local pathways: how global market shocks and supply chain governance translate into local production, land-use, and environmental outcomes; and (ii) local-to-global pathways: how local production decisions, resource uses/exploitation and policies scale up to affect global markets and ecological services. Since these connections are multidimensional, my research vision is to pursue these areas of research through creating an interdisciplinary research lab, collaborating with experts from earth science, environmental science, soil science, geography, data science, statistics and international relations. My specific focus lies in applying economic theory, such as structural gravity models and computable general equilibrium (CGE) models, to conduct policy experiments, and econometric techniques to estimate partial equilibrium and causal effects. I leverage a variety of datasets, including national and global statistics, surveys or even web scrapping, at households or farms, firms or products as well as geo-spatial data within and across countries.

Below, I discuss my research agenda, highlighting my PhD thesis works as indicative of my broader research trajectory.

1. Understanding farm management and production decisions in the face of local and global shocks

The agricultural system is facing the conflicting forces at play: political trends hindering productivity (such as, promoting low-productivity agricultural practices (small-scale farming, organic agriculture), imposing limits on GMOs, diverting funding away from agricultural R&D, mandating animal welfare, biofuels and environmental compliances, and increasing protectionism and trade restrictions) versus the reality of growing food demand (Sexton 2025). This motivates my research agenda of understanding how producers make decisions in the face of such challenges.

My predoctoral papers, though small-scale, align with understanding producer motivations and farm-level choices. In "What motivates producers and consumers towards organic vegetables? A case of Nepal", I use producer- and consumer-level surveys and employs probit regression to identify the determinants of producers' willingness to adopt organic practices and consumers' willingness to pay for organic vegetables. In two papers, "Competitiveness of banana value chain along Hetauda-Dumkibas road corridor, Nepal: An eclectic approach" and "Profitability, productivity and resource use efficiency of banana production in Hetauda–Dumkibas road corridor, Nepal", I conducted a value chain analysis of the banana business using the structure–conduct–performance framework (SCP) and estimate benefit–cost ratios of 1.57–1.92 in banana production, slightly increasing returns to scale (1.037), and input under-/over-utilization patterns (e.g., underuse of fixed inputs and labor; overuse of manures/plant protection) by applying cost–return analysis, a Cobb–Douglas production function, and efficiency diagnostics to farm-level survey data.

One of my thesis chapter investigating the effects of farmland prices on land use expansion/deforestation is also an effort in understanding producers' decision on land use. In this paper, I consider farmland prices not only as a reflection of contemporaneous farm rents, but also as producers' expectations about future farm rents and potential development rents (such as those from urbanization or industrial use). Taking the case of Brazil, which has seen a spectacular transformation of agriculture in the last two decades at the cost of the environment, understanding the relationship between farmland prices, export demand, and deforestation warrants attention. In the face of a dramatic rise in farmland prices over the last decade in Brazil, understanding the factors that contribute to this trend is particularly important, because it has a direct connection with deforestation. Moreover, the conservation of ecosystem services has been compromised in the face of both local (governance, property rights, and increasing urbanization)

and global pressures (rising commodity demand and prices). The study aims to inform policymakers about the factors, such as farm rents, future rents, spatial spillovers, or urban pressures, that best explain the rise of farmland values. Furthermore, the effect of land prices on deforestation may vary across Brazilian sub-regions. By employing data on land prices, export values, and deforestation attributed directly to agriculture across the municipalities of Brazil, I intend to provide insights into the economic and spatial dynamics linking land expansion decisions to land prices.

This paper has helped me define a future research agenda. One promising direction is to use machine learning methods to identify the factors that explain rising land prices in Brazil. In the longer term, my goal is to understand what makes farming systems resilient at both farm and regional levels. Based on these factors, I aim to develop resilience metrics that bridge concepts from engineering resilience (e.g., time to recover, variance, stability) and social-ecological resilience (e.g., adaptive capacity, substitution options, network connectivity). These metrics would draw on data such as yields, vegetation anomalies, soil and erosion indices, hydrologic extremes, and management practices. I plan to incorporate these resilience metrics into farm profit models and market models so that they can serve as forward-looking indicators to inform decisions by policymakers and practitioners. I intend to pursue this research agenda through interdisciplinary collaboration.

2. Understanding policy, market and environment

One of my primary lines of research includes investigating the effects of policy/regulations on agricultural markets and environmental outcomes. In my job market paper, titled "Costly Regulation, Minimal Results: The EU Deforestation Regulation Effect on Global Soy Trade", I analyzed the effect of trade restriction policy embedded in the EU Deforestation Regulation (EUDR) on global soybean trade and its implications for deforestation linked to soybean production. I develop two scenarios: one in which all countries comply with the EUDR, and another in which three major deforestation-risk countries, Brazil, Argentina, and Paraguay (BAP), do not comply. These countries account for 59.3%, 6%, and 4.4% of deforestation linked to soybean production, respectively (Persson et al. 2024). I estimate the counterfactual trade flows under these scenarios using the procedure developed by Anderson, Larch and Yotov (2018), which holds supplies and expenditures constant while allowing domestic and bilateral trade to adjust in response to changes in multilateral resistances stemming from the compliance costs. The key finding is that the EUDR shifts soy trade away from Europe and toward China, raises prices for EU consumers, and does little in the short run to reduce deforestation pressure in major South American producers. The paper has been resubmitted with revision for publication in the European Review of Agricultural Economics.

In my second job market paper, titled "Foreign demand, export Sales, and deforestation: A commodity level analysis", I quantify the causal effect of international demand on deforestation using a global country–commodity–year panel covering 138 countries and 18 commodity groups over 2001–2022. I measure international demand in two ways: (i) a shift–share foreign-demand that aggregates plausibly exogenous importer–product demand shocks, and (ii) export sales by country and commodity. To address simultaneity between exports, prices, and deforestation, I use foreign demand as an instrument for export sales in a control-function PPML framework saturated with country–year and commodity–year fixed effects. Three main results emerge. First, higher foreign demand leads to significantly more deforestation: a 1% increase in foreign demand raises commodity-level deforestation by about 0.11%, and a 10% increase in export sales increases deforestation by 2–4% on average. Second, these effects are highly heterogeneous across commodities. Elasticities are largest for land-intensive perennial export crops—palm, cocoa, rubber, stimulants/spices, nuts, coffee, sugar crops, soybeans, and cattle—while staple grains and many horticultural crops show weak or no responses. Third, impacts are geographically concentrated in South America and Southeast Asia, with important but smaller effects in parts of Africa and the rest of Asia, and weak responses in Europe and North Asia. These elasticities can be used as behavioral parameters in quantitative trade and land-use models and help simulate policy experiments

for trade-linked environmental regulations.

These papers lay out future research agendas for me. In trade-environment literature, the use of trade restrictions to discourage environmental degradation is often discussed. Examples include the Climate Club concept by Nordhaus and Contingent Trade Agreements by Harstad. However, empirical evidence on how such restrictive interventions transfer to producers is less explored. To understand the potential effects of such policies, I plan to employ variations in tariffs as an exogenous trade restriction variations. Taking the cases of Brazilian major export crops, I aim to construct the localized tariff faced by each municipality based on their historical export shares. This study contributes to understanding whether trade restriction policy is indeed an effective measure to curb environmental degradation. Furthermore, the EUDR includes other commodities, such as palm oil, rubber, cattle, cocoa, coffee, and wood products. Evidence and robust measurements of environmental effectiveness for these commodities are also warranted, particularly in measuring deforestation leakage and indirect land use changes. Furthermore, governance and implementation challenges, such as traceability and interactions with local laws, deserve research.

An additional research agenda involves examining how international governance (e.g., the EUDR and voluntary sustainability standards) and the market conduct of multinational firms shape land-use change and environmental outcomes. The premise is that large multinational firms act as intermediaries in global supply chains and wield significant market power—either as oligopsonists aggregating commodities (leading to markdown behavior) or as oligopolists selling in global markets (leading to markup behavior). The transmission of deforestation-free policies and price premia (or consumer willingness to pay) depends critically on firms' conduct along the supply chain. I am interested in understanding how policy and market structure interact to shape producers' decisions, particularly land-use choices.

3. Understanding the role of international trade and supply chains in the transmission of local shocks to remote markets

An area for future research to me is the investigation of how local or domestic interventions can transfer through supply chains and ultimately affect global markets and environmental outcomes. For example, the effect of local restrictions on fertilizer use, domestic protections (subsidies or tariffs), or export bans on domestic and global welfare. These local shocks, particularly in global commodities, shift the sourcing strategies of multinational firms and reconfigure global supply chains. In the case of large countries, local changes are powerful and influence global prices, leading to multilateral effects on welfare and terms of trade. Further, building on insights from Villoria, Arita and Sydow (2024), I am interested in how the structure of farm programs, output subsidies, and trade policies interact with climate-induced productivity shocks and how these interactions shape adaptation and mitigation outcomes at the global scale. Additionally, I plan to explore the systemic risks that may arise when extreme weather or natural disaster events, such as droughts or floods, hit certain countries. Understanding how disruptions in key "breadbasket" regions (for example, the US and Brazil for soybeans, Southeast Asia for palm oil, South Asia for rice) can amplify volatility in global markets is crucial. This line of inquiry will also consider the role of institutional and governance capacity in mediating these cascading effects.

Moreover, teleconnections are large-scale climate linkages (for example, ENSO-like patterns) that allow a local environmental shock to alter weather and production conditions in the remote markets. In agriculture, this mechanism can shift yields and prices in remote markets. This is actually a complex phenomena that involve multi-level reactions and feedback effects. For example, measuring the socio-economic effects of such mechanisms requires expertise from multiple disciplines, such as earth sciences, policy and international relations, statistics, and economics. One of the reasons behind my training with global trade models, such as Global Trade Analysis Project, is for future collaborations, as such models can be connected with global land-use or climate models to answer the economics-cum-environment problems.

References

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